

THE PHYSICAL GEOGRAPHY

(GEOMORPHOLOGY)

of

William Morris Davis

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WILLIAM MORRIS DAVIS

Compiled, Illustrated, Edited and Annotated

by

Philip B. King

and

Stanley A. Schumm

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Senior Editor's Preface

In 1912, William Morris Davis, who had long been a professor at Harvard University, became professor emeritus, and for a time devoted himself to various research projects, such as a study of coral reefs in the South Pacific. From the early twenties and for the remainder of his life, until 1934, he was lecturer and visiting professor at many western schools. Although his great system of geomorphology (or 'physical geography' as he always called it) had been evolved during his Harvard years, in many ways the period after his retirement was the most influential of his career.

Whereas at Harvard he was, to his students, a crotchety and unhelpful taskmaster (so G.R. Mansfield told me), during his career in the western schools he lectured with fewer inhibitions regarding his philosophy; these lectures, and his many personal contacts, profoundly influenced a whole generation of younger earth scientists. (Although he always considered himself to be a 'geographer' his greatest impact was on young geologists.) All these younger men knew instinctively that Davis was a great man and teacher, at whose feet they should sit and worship.

I knew this, for one, because at the same time I was becoming acquainted with other famous geologists - whose fame so often diminished as one approached, and who often seemed to operate with the most trivial and petty of motives. Davis was never trivial or petty! All his faults and virtues had epic proportions! But this aside, Davis's inspiration to me went beyond his own specialty, for he introduced me to deductive science. Already, in the nineteen-twenties, geologists were off in pursuit of a more exact basis for their science, couched in terms of mathematics, physics, and chemistry - a trend which oppresses us even more today, and for which I knew from the beginning that I had no talent whatsoever. But Davis showed how many secrets could be unlocked by simple rationalization and deduction, and offered the hope that, for a few decades at least, there was still an opportunity for a constructive career in non-mathematical geology.

My first contact with Davis was when I was doing a semester of graduate study at the University of Iowa in the autumn of 1925, when he stopped off briefly to lecture on the Basin Ranges and on Coral Reefs.

In the following year, by good fortune, I was able to renew the acquaintance at the University of Texas, when Davis was visiting professor during the winter term of 1926-1927, and I was a young instructor. I did not register for his course, but I attended his lectures faithfully, taking the notes which have been written up in

this volume. I answered some of his examinations, and I still have in my possession the papers, graded and vigorously corrected by him.

For the most part, Davis's influence at Texas fell on sterile ground; students at Texas who took his course were simply not prepared for him. One day, after a long exposition of a region with cuesta topography, he asked, "Where is it?", and one student said, "It sounds like the country down around Houston". Actually, the region was south-eastern England, whose resemblance to anything in the Texas Coastal Plain was remote. His greatest influence at Texas, then, was on post-graduate geologists - myself for one, and W.S. Adkins for another, both of us at the time preparing geological reports on West Texas. Davis opened our eyes to the principles of arid erosion, not widely understood at the time, which bore directly on our work - although we were continuously frustrated by his insistence on a form of concise 'geographical description', supposedly the ultimate objective of his whole system, but actually an absurd and unworkable formula, little used by Davis himself in his own writings.

My later contact with Davis was at the University of Arizona, where he was visiting professor during the spring semester of 1930, and I was again an instructor. I did not attend his classes this time, and our relations were entirely personal and social, but knowing him again helped me much to fill in the chinks of my conception of his philosophy.

He and Mrs. Davis arranged many picnics for the geology faculty to places of geomorphic interest in the desert around Tucson, at which Davis played the great man and showman. At other times I had opportunities to discuss with him some of his work in progress - on desert erosion, basin-range topography, and processes of cave formation. Once I was invited on a field trip when Douglas Johnson was a visitor, to see the desert terrain around Tucson. I recall that Johnson told Davis he thought Davis's terms, the 'King formations', 'King folds', 'Powell surface', 'Gilbert fault blocks', and 'Louderbacks', were "rather trivial" - a liberty that only another 'great' could take with Davis. I also took Davis on some field trips of my own, where there was an odd contrast between the views of a theoretical geomorphologist and that of a practical field geologist. It was on one of these trips that (Quaker puritan that he was) he denounced the highway signs south of Tucson, advertising night spots in Nogales, as "an invitation to a debauch".

From 1930 until 1962, my Davis notes were carefully preserved, with the hope that someday something could be done with them. A few topics had been written up in better form than the rest, but most of them remained in the rough form in which they had been put together in Austin and Tucson, years before. In 1962, a break in my work for the U.S. Geological Survey offered an opportunity to work up the material in better form. This work was a labor of love, intended mainly for my personal reference, but I did make copies of the typed pages, that I deposited in the three libraries of the Geological Survey.

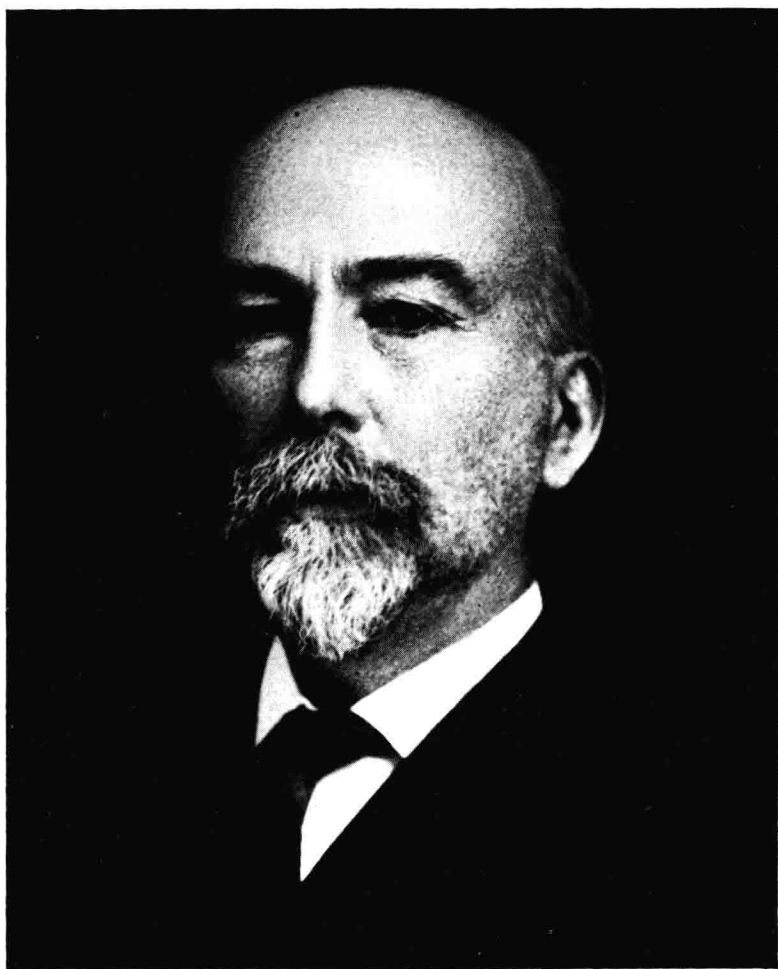
As time went on, I discovered that these library copies had been much used, and I was urged by many geomorphologists to make them available in a more permanent publication - requests that have continued until now. It has only been recently, after my retirement from the Geological Survey, that the time was available to do the necessary typing and editing to make this possible, and the results are presented herewith, with the able help and counsel of Stanley Schumm.

During the nearly half-century gap between the original note-taking and the present, Davis's concepts have gone into gradual eclipse among geomorphologists, and many of them, it is true, now seem quaint, old-fashioned, and oversimplified. But many of the great principles on which they were based, though often overlooked today, are still valid - especially the concept of a continual evolution of landforms from the past, through the present, into the future. Valid or not, the record is at least worth preserving as a statement of the methods used by Davis, directly from the master himself.

The text presented herewith is based largely on my original notes on the Davis lectures, with only minor editing and rewriting. In addition, I acquired from Davis in Tucson in 1930 a 42-page text with 3 pages of errata, labeled 'University of California, Summer Session 1929, Geology 102, Outline No. 1', covering a course given at Berkeley the year before. This covers much the same ground as my own notes and amplifies them in places; where appropriate, these parts are worked into my text. In general, I have tried to retain as far as possible the statements made by Davis himself. In a few places Davis presented remarks on the historical background of geomorphological studies, as on the Great Plains of Montana, the Basin Ranges, and arid landforms; I have amplified these somewhat from the available record. Also, for the section on Coral Reefs, my original notes were inadequate, so I have expanded them from Davis's own publications. Other than these, my own comments are given in notes at the end, along with many other comments contributed by Stanley Schumm.

Actually, my own personal interest is not in the theories of geomorphology, but in landscape drawing and diagramming, a subject in which Davis was also a master; a secondary major objective of this book is to present a large selection of the Davis drawings and diagrams. Many of the smaller figures given here are my copies of Davis's blackboard sketches made during the lectures. Besides these, I have endeavored to collect and reproduce as many as possible of the superb landscape drawings and diagrams that accompanied Davis's publications. These figures, I found, were in widely scattered publications, and had never before been collected in one place. I have reproduced here all those which I judge to be significant; those which I have not used I believe to be too trivial to be worth considering. Many of these figures illustrate specific points in the text, but others which do not bear directly on the text are included for their own sake. It is hoped that this collection will inspire other geologists and geomorphologists to continue to practice the art.

Philip B. King
Menlo Park CA
1979



W.M. Davis

Photo 1 W.M.Davis about 1912, the year of the publication of *Die Erklärende Beschreibung der Landformen*.

Junior Editor's Preface

Sometime late in 1966 I discovered in the Geological Survey library in Denver an intriguing document. It consisted of a set of illustrated lecture notes from a course entitled Physical Geography, which was presented by W.M. Davis in 1927 at the University of Texas and an outline of a similar course presented in 1929 at the University of California at Berkeley. The notes were of considerable interest to me at that time because they showed, among other things, that Davis was discussing and had accepted parallel-slope retreat and pediments during these lectures. My knowledge of his work was primarily second-hand and through his early publications (1890-1906), as collected by D.W. Johnson in the volume *Geographical Essays*, and everything that I had read indicated that Davis was the advocate of declining slope retreat. Nevertheless, the notes showed that he had accepted the concept of parallel slope retreat before 1927.

The original Davis papers are very long and sometimes tedious, but the notes provided an opportunity to review his geomorphology in brief. The only other such review was published in German by Davis in 1912 as *Die Erklärende Beschreibung der Landformen*. Subsequently, I corresponded with Philip King in order to acquire a personal copy of the notes. Through the years I remembered my excitement in finding this compilation, and I regretted that the notes were not available to a wider readership. In 1976 King and I agreed to do something about the publication of the notes, and the results are before you.

The notes have been edited both by King and myself and the material in a 42 page outline which was prepared by Davis for the University of California course was partly incorporated into King's notes. The outline was used to fill out those parts of King's notes that dealt with topics that were given a very brief treatment in 1927.

The notes contain some material that can now be considered trivial and some that is incorrect, and for this reason the text is annotated. Nevertheless, the opportunity to present in one publication the mature considerations of an eminent geomorphologist led us both to the conclusion that the notes should be made available to the geomorphic public. Much of the value of the notes are the illustrations prepared by King from Davis's blackboard sketches and from his published works. Few geomorphologists today have this facility with pen and ink.

Perhaps the main reason that we believe that the notes should be made generally available is, as Chorley stated (1965),

"that what is most easily available to students today as the 'essential' teachings of Davis are certain of

Preface

his essays written prior to 1909 and the writings of his most influential students."

Nevertheless, Davis

"showed remarkable versatility after the age of seventy, modifying his views on peneplanation and the youthful stage, recognizing the lack of real differences between many humid and arid landforms, and acknowledging - the difficulty of applying simple cyclical notions to an area of active orogeny."

In fact, he was intuitively aware of the significance of the hydraulic concept of roughness and continuity (Chow, 1959).

Much of the young Davis appears in these notes, but his recognition of the complexity of the landscape and the need for alternative explanations is also present in his lectures delivered in his 77th year. We hope this abbreviated version of his system of geomorphology will be of interest and may partly rehabilitate his reputation.

The concept of the erosion cycle as advanced by Davis has been attacked and defended by many earth scientists, but nevertheless, Davis produced a revolution in geomorphology by providing a paradigm from which to evaluate the landscape of this planet. Certainly Davis cannot be blamed if his followers attempted to force nature to conform to this paradigm.

An appropriate inclusion in this preface is a quote from Davis's outline prepared for the University of California course. In it he tells us what the course is about and how to see the landscape.

"Land Physiography, with which this course is concerned, treats chiefly the present forms of the continents and islands, their origins and changes; it thus treats the inorganic side of Geography. The description of a landscape may omit all theoretical explanation and state only the actual facts of occurrence that may be directly observed. Such a description may be called empirical, as it is based on observational experience. Or the attempt may be to describe the visible facts of a landscape as far as possible in terms of their origin. Such description may be called rational, genetic, or explanatory. Explanatory description will be emphasized in this course.

"For example, in the case of what appears to be an up-arched highland, more or less dissected by its rivers, but not as yet sufficiently dissected to obliterate completely all parts of its highland surface, an explanatory description involves the explicit statement of three items: 1) the preexistent form, before the up-arching took place, 2) the effect of the up-arching, and 3) the work of erosional agencies upon the up-arched mass during and after its up-arching.

"The first of these three items itself calls for a three-item statement: A) the structure of the underlying rock mass, B) the nature of the agencies that have worked on it, and C) the stage reached in their work when the up-arching was initiated. In other words - structure, process, and stage. The ABC of the former cycle make item 1 of the present cycle.

"When the present cycle is so far advanced that all traces of the former are obliterated, the three-item description can be shortened by omitting items 1 and 2, and presenting only item 3."

Today the geomorphologist is far less interested in the explanatory descriptive approach, but nevertheless, the history of a landscape and of a particular landform must be understood both in the long and short term (geologic and engineering time) in order that the effect of man on a landform can be evaluated and future changes predicted.

Davis would have enjoyed evaluating man's impact, and he would have been an exceptional writer of Environmental Impact Statements as well as a convincing expert testifying in court concerning the results of man's activities on the landscape.

The lecture notes reflect the situation encountered by very many professors. The subjects treated in the earlier part of the course are considered in detail, but as the end of the semester approaches the time required to elaborate on the final few topics is too short. Davis too found time running out, and so the topics of marine and glacial landforms were given less complete treatment and the notes terminate abruptly. The first two-thirds of the notes are of the most interest because of the detail. Even with King's illustrations the remainder is of much less value.

Those readers interested in learning more about Davis's contributions should read Chorley et al (1973), of course, and should refer in addition to the original publications. A complete publications list is given by Daly (1945) and this is reprinted in full as an Appendix to the hard cover edition of this book. For an explanation of the wide appeal of Davis's ideas, see Higgins (1975) and Beckinsale (1976).

Stanley A. Schumm,
Fort Collins, Colorado
1979

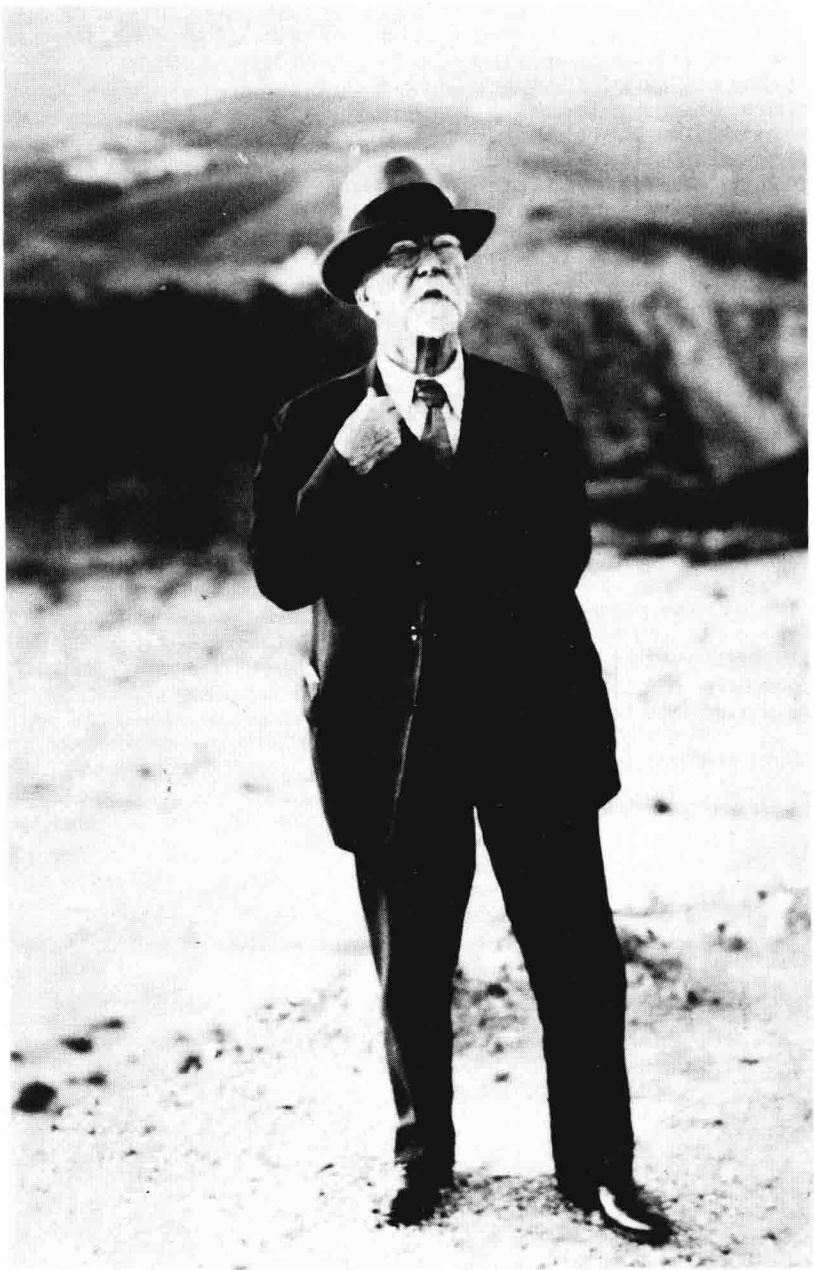


Photo 2. W.M.Davis photographed three or four years after giving the lecture course on which this book was based. The photograph was taken in the field in California in 1931, two weeks after his 81st. birthday.

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